$$\alpha-h=\alpha_1+h_1, \text{ or } h+h_1=\alpha-\alpha_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2).$$

But $\lambda=40°$, $\alpha=343°$, $\alpha_1=245° \ 45'$. $\delta=-30° \ 12'$, $\delta_1=-26° \ 12'$.

$$\therefore \ 662065\cos h-687337\cos h_1=39538 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3).$$

$$\cos(h+h_1)=\cos 97° \ 15'=-.12620 \ldots\ldots\ldots\ldots\ldots\ldots (4).$$

Let $\cos h=x$, $\cos h_1=y$. From (4) $y=-.12620x\pm.992005\sqrt{1-x^2}$. This in (3) gives, $748806.9294x\mp681841.7407\sqrt{1-x^2}=39538$.

$\therefore \ x^2-.057736x=.451771$. $\therefore \ x=.701626$ or $-.643890$.

$\therefore \ h=45° \ 26' \ 31''$ or $130° \ 4' \ 57''$. The first value of h gives h_1 positive.

$\therefore \ h=3$ hours, 1 minute, 46 seconds.

$\therefore$ sidereal time$=\alpha-h=19$ hours, 50 minutes, 14 seconds.

37. Proposed by F. M. SHIELDS, Coopwood, Mississippi.

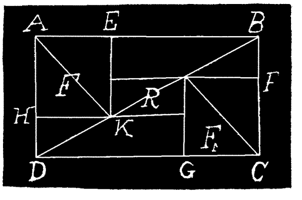
A gentleman owned and lived in the center, R, of a rectangular tract of land whose diagonal, D, was 350 rods, dividing the tract into two equal right-angled triangles, in each of which is inscribed the largest square field, F and F_1, possible; the north and south boundary lines of the two square fields being extended and joined formed a little rectangular lot, R, in the center around the residence. The difference in the area of the *entire rectangular* tract and the *sum* of the areas of the two square fields, F, F_1, is $187\frac{1}{2}$ acres. Give the dimensions and area of the entire tract, and one of the square fields, F or F_1.

I. Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Applied Science in Texarkana College, Texarkana, Arkansas-Texas.

Let $AB=a$, $AD=b$, $AH=x$. $\therefore \ a^2+b^2=122500 \ldots\ldots\ldots\ldots\ldots\ldots (1)$.

$ab-2x^2=187\frac{1}{2}$ acres$=30000$ square rods... (2).

$ax+bx=ab \ldots\ldots\ldots\ldots\ldots\ldots (3)$,



from triangles BAD and BEK.

From (3) $x^2(a^2+2ab+b^2)=a^2b^2 \ldots\ldots\ldots (4)$.

(1) and (2) in (4) gives $62500x^2=900000000$.

$\therefore \ x^2=14400$ square rods$=90$ acres.

$\therefore \ x=120$ rods.

$\therefore \ ab=58800$ square rods$=367$ acres.

$\therefore \ a+b=490$ rods. $a-b=70$ rods. $\therefore \ a=280$, $b=210$.

II. Solution by ISAAC L. BEVERAGE, Monterey, Virginia.

If $a=AB$ and $b=AD$, then $ab=$area of entire farm. Now $ab/(a+b)=AH$, since it is the side of an inscribed square of a triangle.

$\therefore \ [ab/(a+b)]^2=$the area of F or F_1. Hence, we readily obtain,

$$ab-2[ab/(a+b)]^2=187\tfrac{1}{2}\times160 \ldots\ldots\ldots\ldots\ldots\ldots (1),$$

$$\text{and } \sqrt{a^2+b^2}=350 \ldots\ldots\ldots\ldots\ldots\ldots (2).$$

Whence $a=280$ rods, and $b=210$ rods; also $ab=58800$ square rods $=367\frac{1}{2}$ acres. $\therefore ab/(a+b)=120$ rods, and $[ab/(a+b)]^2=14400$ square rods $=90$ acres.

III. Solution by A. H. BELL, Box 184, Hillsboro, Illinois.

Let 350 rods $=87\frac{1}{2}$ chains $=2a$, $DK=a-y$ and $BK=a+y$. Also, $187\frac{1}{2}$ acres $=1875$ square chains $=b^2$, and side of square $=x$; then $DG=EB=\sqrt{(a+y)^2-x^2}$, $DH=BF=\sqrt{(a-y)^2-x^2}$,

$$(\sqrt{(a+y)^2-x^2}+x)^2+(\sqrt{(a-y)^2-x^2}+x)^2=4a^2 \ldots\ldots\ldots\ldots (1).$$

Plainly, $$x\sqrt{(a+y)^2-x^2}+x\sqrt{(a-y)^2-x^2}=b^2 \ldots\ldots\ldots\ldots (2).$$

$(2)\times 2$, and subtracted from (1), when expanded, $y^2=a^2-b^2 \ldots\ldots (3)$.

$$a+y : a-y :: \sqrt{(a+y)^2-x^2} : x. \quad \therefore x^2=(a^2-y^2)^2/2(a^2+y^2) \ldots (4).$$

Substituting values, $y=6.25$ chains, $x^2=90$ acres, $x=30$ chains, $EB=DG=40$ chains, $BF=DH=22.5$ chains, $AB=DC=70$ chains, $AD=BC=52\frac{1}{2}$ chains, $DC\times AD=367\frac{1}{2}$ acres, in the rectangle.

Also solved by *P. S. BERG*, *A. H. HOLMES*, and *B. F. YANNEY*.

PROBLEMS.

45. Proposed by EDWARD R. ROBBINS, Master in Mathematics and Physics, Lawrenceville School Lawrenceville, New Jersey.

Required several numbers each of which, divided by 10 leaves a remainder 9; by 9 leaves 8; by 8 leaves 7; by 7 leaves 6, and so on. Also find the least such number which, when divided by 28 leaves 27; by 27 leaves 26; by 26 leaves 25; by 25 leaves 24, *et cetera ad unum*.

46. Proposed by A. H. HOLMES, Box 963, Brunswick, Maine.

The base BC of the triangle ABC is $2c$, the sum of the two sides, AB and BC, is $2a$. BP is always perpendicular to AB and cuts AC in P. What is the locus of the point P?

47. Proposed by S. HART WRIGHT, A. M., Ph. D., Penn Yan, New York.

In longitude 75 degrees west of Greenwich, latitude 43 degrees, 30 minutes north on January 1, 1895, at 3 o'clock A. M., local time. What points of the ecliptic were then rising, setting and on the meridian? Any other necessary data may be taken from an ephemeris.

48. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pennsylvania.

In case of *mischance*, with what force would the cow, weighing $w=700$ pounds, jumping over the moon, have struck Her Lunar Majesty in the face?